MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

BEF3014 –ECONOMETRICS MODELLING AND FORECASTING

(All sections / Groups)

22 OCTOBER 2019
9 a.m. - 11 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** questions on **SIX (6)** printed pages.
2. Attempt **ALL** questions. The distribution of the marks for each question is given.
3. Write all your answers in the answer booklet provided.
4. Formula sheet is attached to the back of this question paper.

QUESTION 1

Table 1 below presents the data of Malaysian Gross Domestic Product (GDP) growth from 2010 to 2018.

Table 1

Year	GDP growth (annual %)
2010	7.4
2011	5.3
2012	5.5
2013	4.7
2014	6.0
2015	5.1
2016	4.2
2017	5.9
2018	4.7

Source: Data are obtained from World Bank, www.databank.worldbank.org.

(a) Based on the data above, forecast the population growth from 2013 to 2018 using the following forecasting method:
[*Hint: Please ensure that all the computations are accurate to* ***three decimal places***]

(i) Moving average of 2, MA (2) (6 marks)

(ii) Simple exponential smoothing (assume $\alpha = 0.6$, initial value for 2012: 5.5) (6 marks)

(b) Compute MAE and RMSE for each forecasting method. (9 marks)

(c) Based on part (b), suggest and explain which forecasting method performs better. Generate one-period-ahead forecast for the GDP growth of 2019 using your suggested method. (4 marks)

[Total: 25 marks]

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QUESTION 2

Table 2 presents the quarterly electricity production (kWh) for years 2016 to 2018.

Table 2

Time	t	Electricity [Y]	MA(4)	CM(4)	Detrended series
2016Q1	1	120	---	---	---
2016Q2	2	108	---	---	---
2016Q3	3	111			
2016Q4	4	130			
2017Q1	5	139			
2017Q2	6	127			
2017Q3	7	131			
2017Q4	8	152			
2018Q1	9	160			
2018Q2	10	148			
2018Q3	11	150	---	---	---
2018Q4	12	200	---	---	---

Seasonal calculations

Quarter	2016	2017	2018	Seasonal means	Adjusted means
Q1	---				
Q2	---				
Q3			---		
Q4			---		
			Total		4.000

Normalising factor = _____

Continued...

(a) Use classical multiplicative decomposition method to calculate the detrended series and quarterly seasonal indices. (22 marks)

[*Hint: Students are required to reproduce Table 2 in the answer booklet. All the computations are to be rounded up to* ***three decimal places***]

(b) Assuming the trend in the data is $T_t = 102.7594 + 5.4819t$, where t =1 is 2016Q1 and t = 12 is 2018Q4. Prepare the quarterly forecast of electricity production for 2019Q1. (3 marks)

[Total: 25 marks]

QUESTION 3

Consider the following multiple regression model for Malaysia from the period of 1998Q1 to 2018Q3:

$$RGDP = \beta_0 + \beta_1 EX + \beta_2 KLCI + \beta_3 IR + \mu \quad \ldots (3.1)$$

RGDP	:	Real GDP in natural log
EX	:	Exchange rate
KLCI	:	Kuala Lumpur Composite Index in natural log
IR	:	Interest rate

The results are reported in **Table 3.1**.

Table 3.1

Sample: 1998Q1 to 2018Q3
Included observations: 83

Variable	Coefficient	Standard error	t-statistics	Probability
Constant	14.125	0.956	14.775	0.000
EX	-1.183	0.175	-6.760	0.000
KLCI	0.438	0.064	6.844	0.000
IR	-0.042	0.017	-2.471	0.023

R-squared = 0.921
F-statistic = 203.140 [*p-value*: 0.000]
Jarque-Bera test = 4.037 [*p-value*: 0.217]
Serial correlation LM test = 4.747 [*p-value*: 0.545]
White test = 20.769 [*p-value*: 0.124]

Table 3.2: Correlation Matrix

	EX	*KLCI*	*IR*
EX	1	---	---
KLCI	-0.016	1	---
IR	0.667	-0.376	1

Continued...

Based on **Tables 3.1** and **3.2**, answer the following questions:

(a) Interpret the estimated coefficient for the variable of *KLCI*. (3 marks)

(b) Interpret the coefficient of determination. (3 marks)

(c) Using *p*-value at α = 5%, assess if each independent variable explains RGDP significantly. (6 marks)

(d) Has the estimated multiple regression model met the **FOUR (4)** assumptions underlying the method of Ordinary Least Square (OLS)? Explain your answer based on α = 5%. (6 marks)

(e) Generate a 95% prediction interval for the Real GDP in natural log, given *EX* = 4.121, *KLCI* = 7.433, *IR* = 2.96, and the estimated standard error = 0.1416. (7 marks)

[Total marks: 25 marks]

QUESTION 4

(a) Define the following terms:

(i) An integrated time series (2 marks)

(ii) A unit root (2 marks)

(iii) Cointegration (2 marks)

(b) Explain why GARCH is better than ARCH. (4 marks)

(c) Suppose you have been given two different ARIMA (1, 0, 0) fitted time-series models of the variable Y_t:

Model A: $Y_t = 15.0 + 0.3Y_{t-1} + u_t$ ... (4.1)

Model B: $Y_t = 45.0 - 0.3Y_{t-1} + u_t$ ... (4.2)

where u_t is normally distributed error term with mean zero and standard deviation equal to one.

Continued...

(i) The final observation in the sample (time period 100) is $Y_{100} = 51$. Determine forecasts for period 101, 102 and 103 for **both** models. Show the necessary calculations. (9 marks)

(ii) Suppose now you find out that the actual Y_{100} is equal to 53. Revise your forecasts for periods **102** and **103** by taking the new information into account. Show the necessary calculations. (6 marks)

[Total marks: 25 marks]

End of Questions

Formula Sheet

Simple exponential smoothing (SES):

$$\hat{Y}_{t+1} = \alpha Y_t + (1-\alpha)\hat{Y}_t$$

Linear exponential smoothing (LES):

$$L_t = \alpha Y_t + (1-\alpha)(L_{t-1} + T_{t-1})$$

$$T_t = \beta(L_t - L_{t-1}) + (1-\beta)T_{t-1}$$

$$\hat{Y}_{t+p} = L_t + pT_t$$

Mean Absolute Error (MAE) $= \frac{1}{n}\sum_{i=1}^{n}|Y_{t+i} - F_{t+i}|$

Mean Square Error (MSE) $= \frac{1}{n}\sum_{i=1}^{n}(Y_{t+i} - F_{t+i})^2$

Root Mean Square Error (RMSE) $= \sqrt{MSE}$

$Elasticity = b_1\left(\frac{X}{Y}\right)$

Prediction interval = $F_{t+1} \pm (t_{\alpha/2,n-K-1}) * SE$

Summary of *t*-distribution:

df \ Pr	0.05 0.10	0.025 0.05	0.005 0.010
40	1.684	2.021	2.704
60	1.671	2.000	2.660
120	1.658	1.890	2.617
∞	1.645	1.960	2.576

End of Paper